

WHAT IS CLAIMED IS:

1. A medical laser apparatus comprising:
a solid laser oscillating source which emits a beam of a wavelength
 λ_1 in an infrared region of approx. 1040 nm to approx. 1080 nm;

5 a first fiber-based Raman shifter including a first Raman fiber
which generates, when receives the λ_1 -beam from the laser oscillating
source, a first-order Stokes beam of a wavelength λ_2 different from the
wavelength λ_1 by stimulated Raman scattering, the first Raman fiber
being formed with a pair of fiber Bragg gratings which forms a resonator
for the λ_2 -beam;

10 a first nonlinear crystal which wavelength-converts the λ_2 -beam
outputted from the first Raman wavelength shifter to a second harmonic
beam of a wavelength λ_2' in an orange region of approx. 580 nm to approx.
600 nm; and

15 a light guiding optical system which guides the λ_2' -beam to a
treatment part.

20 2. The medical laser apparatus according to claim 1, wherein the
Raman fiber includes a silica(SiO₂)-based optical fiber doped with titanium
oxide (TiO₂).

3. The medical laser apparatus according to claim 1, further
comprising:

25 a second nonlinear crystal which wavelength-converts the λ_1 -beam
from the laser oscillating source to a second harmonic beam of a
wavelength λ_1' in a green region of approx. 520 nm to approx. 540 nm;

an input switching unit which selectively switches input of the
 λ_1 -beam from the laser oscillating source into between the second

nonlinear crystal and the first Raman wavelength shifter; and

an output switching unit which selectively switches between output of the $\lambda 1'$ -beam from the second nonlinear crystal to the light guiding optical system and output of the $\lambda 2'$ -beam from the first nonlinear crystal to the light guiding optical system; and

5 wherein the light guiding optical system is also adapted to guide the $\lambda 1'$ -beam to the treatment part.

10 4. The medical laser apparatus according to claim 1, further comprising:

15 a second fiber-based Raman shifter including a second Raman fiber which generates, when receiving the $\lambda 1$ -beam from the laser oscillating source, the first-order Stokes beam of the wavelength $\lambda 2$ and further a second-order Stokes beam of a wavelength $\lambda 3$ different from the wavelengths $\lambda 1$ and $\lambda 2$ by the stimulated Raman scattering, the second Raman fiber being formed with two pairs of fiber Bragg gratings which form resonators for the $\lambda 2$ -beam and the $\lambda 3$ -beam, respectively;

20 a third nonlinear crystal which wavelength-converts the $\lambda 3$ -beam outputted from the second Raman wavelength shifter to a second harmonic beam of a wavelength $\lambda 3'$ in a red region of approx. 610 nm to approx. 630 nm;

25 an input switching unit which selectively switches input of the $\lambda 1$ -beam from the laser oscillating source into between the first Raman wavelength shifter and the second Raman wavelength shifter;

an output switching unit which selectively switches between output of the $\lambda 2'$ -beam from the first nonlinear crystal to the light guiding optical system and output of the $\lambda 3'$ -beam from the third nonlinear crystal to the light guiding optical system; and

wherein the light guiding optical system is also adapted to guide the $\lambda 3'$ -beam to the treatment part.

5. The medical laser apparatus according to claim 4, wherein the second Raman fiber uses at least a part of the first Raman fiber in common.

6. The medical laser apparatus according to claim 3, wherein the input switching unit and the output switching unit include a fiber switch.

10 7. The medical laser apparatus according to claim 4, wherein the input switching unit and the output switching unit include a fiber switch.

15 8. The medical laser apparatus according to claim 1, wherein the laser oscillating source includes an Nd:YAG laser, an Nd:YLF laser, or a Yb-doped fiber laser.